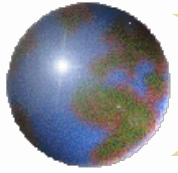


*Improved Materials Management
– Quantifying the Energy and
Climate Benefits of Recycling*

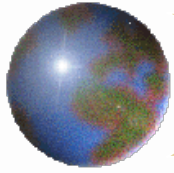
Henry Ferland, U.S. EPA

September 20, 2005



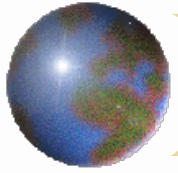
Presentation Overview

- ✚ Introduction
- ✚ Climate Change Benefits
- ✚ Energy Benefits
- ✚ Available Tools & Demos
- ✚ Summary



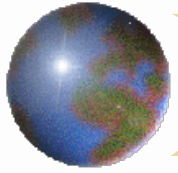
Introduction

- ✚ The EPA Climate and Waste Program's mission: to identify and address linkages between waste reduction and climate protection
- ✚ Quantification of the GHG and energy impacts of recycling requires a life-cycle approach
- ✚ Recycling can significantly reduce GHG emissions and conserve energy



Life-Cycle Approach

- Incorporate the full range of GHG effects through a material's life cycle
- Use IPCC accounting methods for GHG emissions and sinks
 - Global Warming Potentials (GWPs)
 - Carbon cycling in forests
 - CO₂ emissions from combustion
- Developed GHG Emission Factors and Energy Factors



Climate Change Benefits

● Upstream Benefits

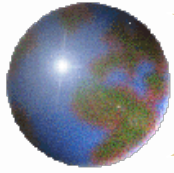
- Reduce carbon dioxide emissions from energy use in the material acquisition and manufacturing stages
- Increase carbon storage in forests
- Increase carbon storage in soils when organics are composted and applied to the soil

● Downstream Benefits

- Avoid landfill methane emissions
- Avoid carbon dioxide emissions from combustion

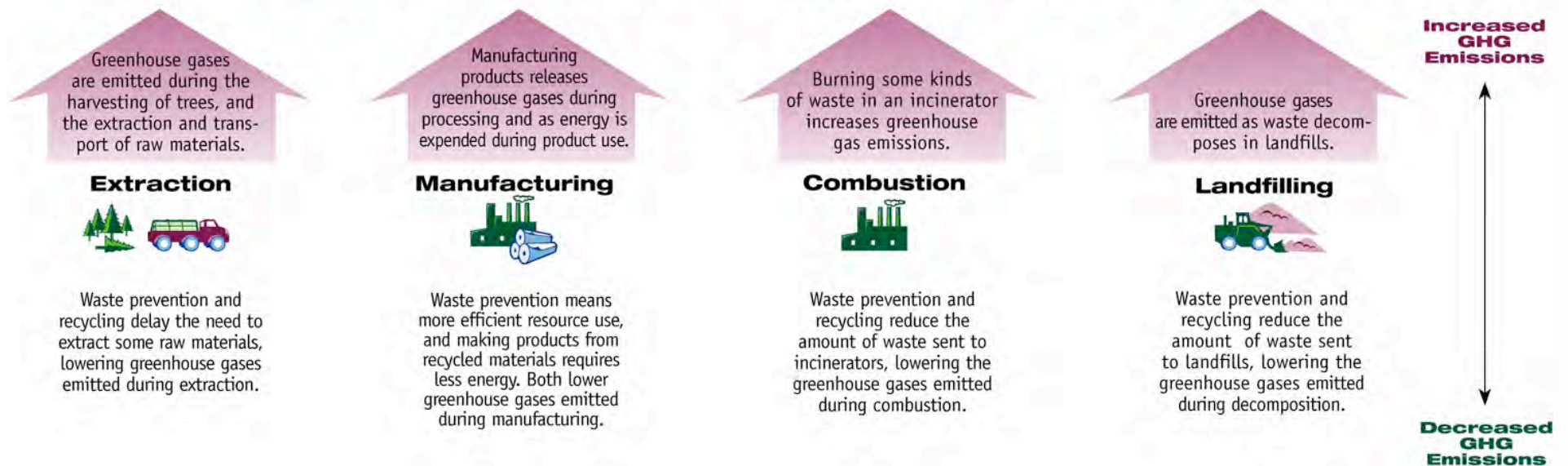
● Full Analysis Provided in EPA's Revised Report:

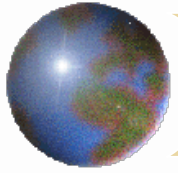
- "Solid Waste Management and Greenhouse Gases"



What is the Link?

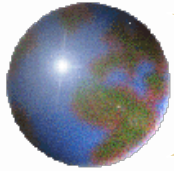
The Link Between Waste Management and Greenhouse Gases





Climate Benefits (cont.)

- ❖ Waste is important source of GHG emissions
- ❖ Waste activities account for approximately **3%** of total U.S. GHG emissions
- ❖ Waste-related actions result in emission reduction benefits that are realized across multiple industrial sectors



Life-Cycle Approach (cont.)

You Can Make a Difference!

By choosing to prevent waste and recycle, you can help curb climate change. Assume your office, for example, throws away 100 tons of white office paper each year. If you recycle just half that amount of paper, look what happens:

Scenario 1

Throwing away
100 tons
of office paper

**Waste
Management
Impact:**

62 MTCE



Trees are harvested.



Logs are transported to a paper manufacturer.



Paper is manufactured.



Workers use and dispose of paper.



Trash is collected and transported to a landfill.



Paper is buried in the landfill.

Scenario 2

Recycling 50 tons
of that paper

**Waste
Management
Impact:**

-3 MTCE



Fewer trees are harvested.



Fewer logs are transported to a paper manufacturer.



Less paper is manufactured from virgin material.



Workers use and recycle paper.



Paper is collected and transported to a recycling facility.



The recovered paper is remanufactured.

75

50

25

0

-3

75

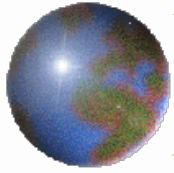
50

25

0

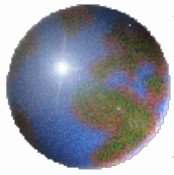
-3

Greenhouse Gases Released (Measured in MTCE)



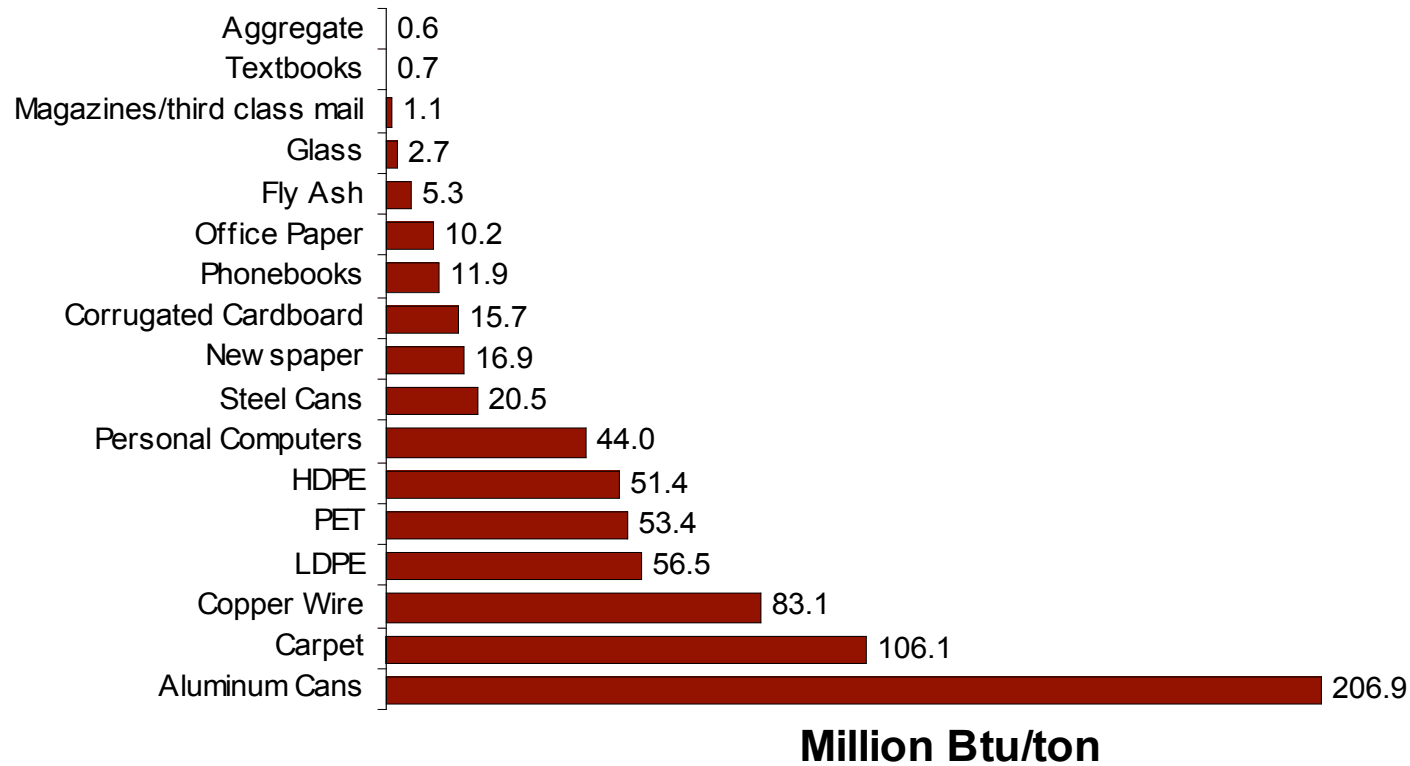
Energy Benefits

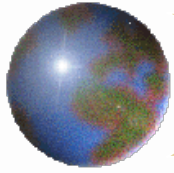
- ✚ Decrease the Demand for Raw Materials (e.g., trees, bauxite)
 - ▣ Reduce energy associated with raw material extraction
- ✚ Reduce the Amount of Energy Needed for Manufacturing and Transportation
- ✚ Energy Production from Landfill Gas & WTE



Recycling Energy Savings

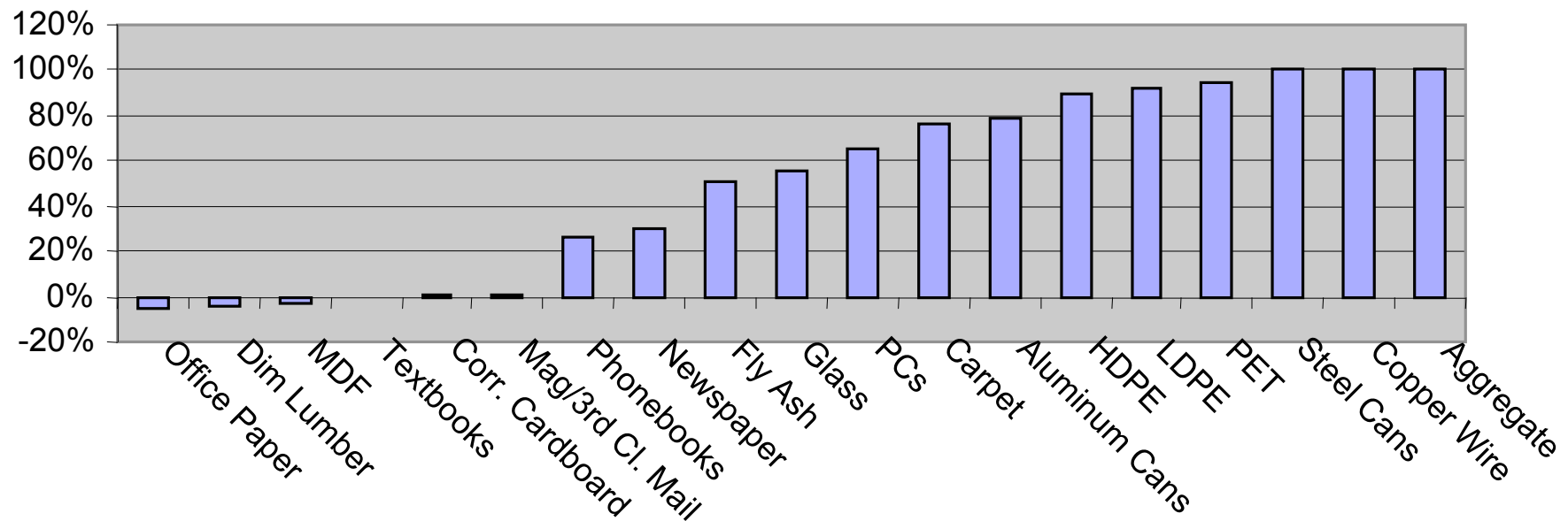
**Energy Savings Per Ton Recycled
(Million Btu)**

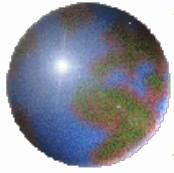




GHG vs. Energy Savings

**Recycling GHG Benefits Attributable to Energy Savings
(Recycling vs. Landfilling)**



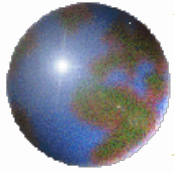


Outreach and Tools

- Publications and Outreach Materials available at:

www.epa.gov/mswclimate

- Three Tools also available: WARM, ReCon, DGC



Tools

Waste Reduction Model (WARM)

- Assess GHG and energy impacts of waste reduction activities
- Accepts user-specific inputs and provides individualized results
- Available online

www.epa.gov/mswclimate (under "TOOLS")

Global Warming - Waste

WARM Online

EPA created WARM to help solid waste planners and organizations track and voluntarily report greenhouse gas emissions reductions and energy savings from several different waste management practices. WARM Online was last updated on 12/15/2004.

Use this worksheet to describe the baseline and alternative MSW management scenarios that you want to compare. Please follow the steps below to enter your material tonnage information in the input boxes in the tables, and select appropriate landfill and waste transport characteristics.

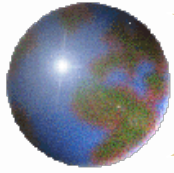
Tips:

- If the listed material is not generated in your community/organization or you do not want to analyze it, leave it blank or enter 0.
- Make sure that the total quantity generated equals the total quantity managed.
- If you have any questions, consult the [WARM User's Guide](#).

Step 1. Baseline Scenario

Please describe your current (or baseline) waste management scenario by entering the tons of each material type that is generated and disposed.

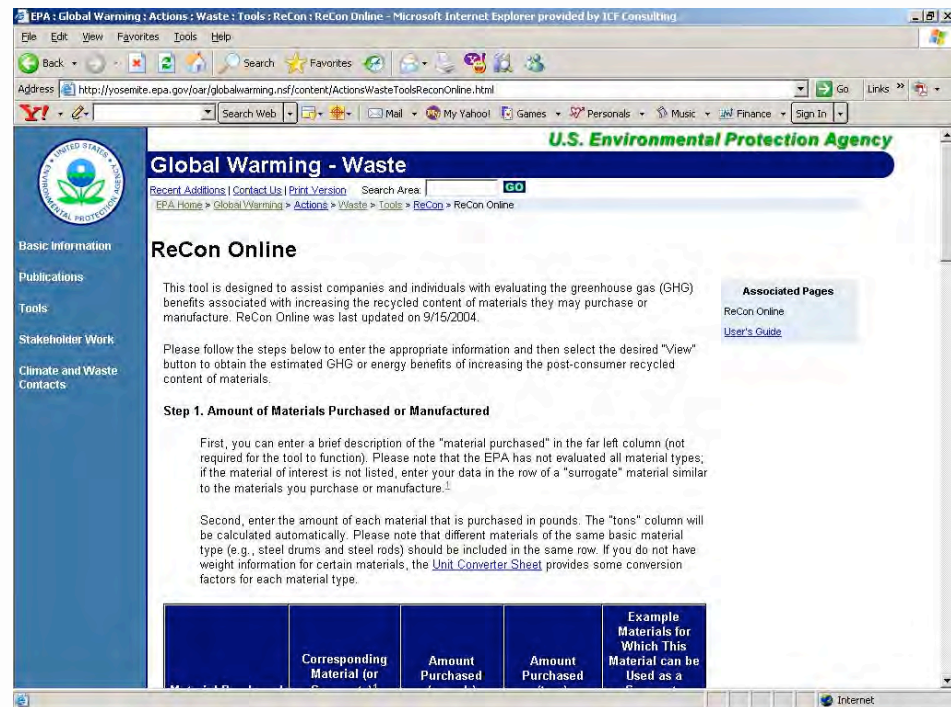
Material	Tons Generated	Tons Recycled	Tons Landfilled	Tons Combusted	Tons Composted
Aluminum Cans	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	N/A
Steel Cans	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	N/A

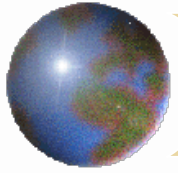


Tools

Recycled Content Tool (ReCon)

- Estimates GHG and energy benefits of increasing recycled content
- Accepts user-specific inputs and provides individualized results
- Available online
 - www.epa.gov/mswclimate (under "tools" and "ReCon")

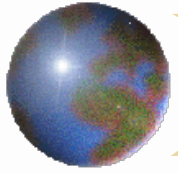




Tools

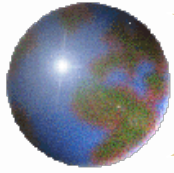
Durable Goods Calculator

- ✚ Assess GHG emissions benefits of different disposal methods for 14 durable goods (i.e., refrigerators, washers, dryers, PCs, autos, TVs, etc.)
- ✚ Accepts user-specific inputs and provides individualized results
- ✚ Available in Microsoft Excel version



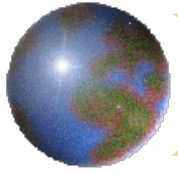
Quantifying Emission Reductions: National Efforts

- ✚ Currently the U.S. Recycling Rate is 30.6%, based on 2003 data
- ✚ The U.S. goal is to reach a 35.0% recycling rate by 2008
- ✚ What Are the Benefits?



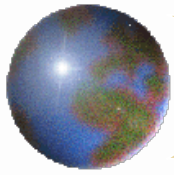
Benefits Cont'd:

- ⊕ 30.6 % Recycling Rate (72.3 million tons of material)
- ⊕ Climate Benefits: 50.8 million MTCE
 - ▣ Equivalent to 40.3 million cars
- ⊕ Energy Benefits: 1.48 quadrillion BTU
 - ▣ Equivalent to 11.9 billion gallons of gas



Benefits Cont'd

- U.S. 35 % Recycling Goal for 2008
- Climate Benefits: 58.9 million MTCE
 - Equivalent to 46.7 million cars
- Energy Benefits: 1.72 quadrillion BTU
 - Equivalent to 13.7 billion gallons of gas



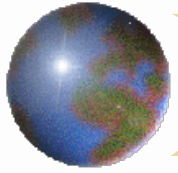
Quantifying Emission Reductions: Local Efforts

● San Francisco, CA

■ Planned Actions by 2012

Action	Projected Impact
Increase residential recycling and composting	(63,500) MTCO ₂ E
Increase commercial recycling and composting	(98,900) MTCO ₂ E
Expand construction and demolition debris recycling	(51,700) MTCO ₂ E
Support alternate collection methods for recyclable materials	(59,900) MTCO ₂ E





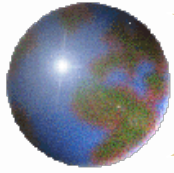
Procurement Programs and Requirements

✿ San Francisco, CA

■ City government required to purchase products with recycled content. Specifically

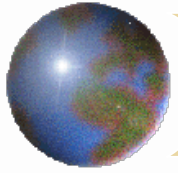
- Paper: minimum 30% PCW (this requirement results in emission reductions of 1.76 MTCO₂E per ton of 30% PCW paper purchased rather than 0% PCW)
- Paper towels: 40% PCW
- Motor oil: 25% re-refined





Summary

- Recycling Offers Significant Energy and GHG Benefits
- The EPA Suite of Tools Can Help Quantify and Communicate These Benefits
 - Incorporate GHG and energy impacts into decision-making processes
 - Communicate GHG emission reductions and energy savings to the public
 - Use GHG and energy impacts to help “sell” recycling programs in new and important ways
 - Incorporate improved materials management into climate action plans at the municipal and state level



Program Contact Information

Henry Ferland, Coordinator

Climate and Waste Program

USEPA (5306W)

1200 Pennsylvania Avenue, N.W.

Washington, DC 20460

Phone: (703) 308-7269

Fax: (703) 308-8686

Email: ferland.henry@epa.gov

www.epa.gov/mswclimate